



DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM
WATER QUALITY MONITORING AND ASSESSMENT SECTION
WATERSHED INFORMATION SHEET

Lamine River Basin-10300103

Basin Description

This basin consists of all the land drained by the Lamine River and its tributaries, except for that drained by the Blackwater River and its tributaries. It covers an area of approximately 1,110 square miles in west central Missouri. The main tributaries of the Lamine in the basin are Heaths Creek, Muddy Creek, of which Shaver Creek and Long Branch are tributaries, Richland Creek, Gabriel Creek, and Flat Creek, of which Haw Creek, Long Creek, and Spring Fork are tributaries. The only sizable lake and the only surface source of drinking water in the basin is Spring Fork Lake, on Spring Fork, south of Sedalia. Average annual precipitation in the basin is 40 to 41 inches. Streamflow statistics for the basin are contained in Table 1.

Table 1. Stream Flow Statistics for Lamine River Basin

Stream/Location	Wtrshd. Area (sq.mi.)	Period Of Record	Flow (cfs)			
			90 th Percentile*	Median**	10 th Percentile***	7Q10 Low Flow+
Flat Cr. near Sedalia		1960-4				0
Heath Cr. near Blackwater		1964-70				0
Lamine R. at Otterville	543	1987-2002	781	74	9.1	
Lamine R. at Clifton City		1923-71				0.2

* Flow is less than this amount 90 percent of the time

**Flow is less than this amount 50 percent of the time

***Flow is less than this amount 10 percent of the time

+ The lowest average seven consecutive day flow that occurs with a recurrence interval of 10 years.

The Lamine River basin is mostly agricultural. Forty-nine percent of the land is pasture or grassland, with a very few remnants of native prairie. Twenty-nine percent is devoted to row crops, twenty-one percent is forest or woodland, and one percent is considered urban.

Much of the eastern portion of the basin lies in the Ozark Plateau physiographic province, while the western portion, along with some of the central headwater areas, lies in the Osage Plains province. The upper parts of the basin are underlain by Pennsylvanian limestones and shales in the west and northwest, and by Ordovician sandstone and dolomite in the south. As the streams flow east and north from plains into hillier terrain, they incise Mississippian and Devonian limestones and enter the Ordovician dolomite.

Since the strata dip toward the north due to the Ozark uplift, the lower Lamine River basin is carved predominantly in Pennsylvanian limestone. Most of the basin is covered by a layer of loess, ranging from very thin in the southwest to around eight feet in the eastern uplands.

There is very little subsurface movement of water in the basin, mainly due to the presence of impermeable shales in the bedrock. Most groundwater that does enter the limestones and dolomites of the basin soon resurfaces where a stream incises an aquitard. Consequently, the Lamine River and its tributaries can have highly variable flows, rising quickly after heavy rainfall and soon returning to low-flow levels.

The lack of permeable bedrock and large amounts of moving groundwater means that there are very few springs in the basin. Of the seven recorded springs in the basin, the four with measured flow are listed in Table 2.

Table 1. Major Springs in the Lamine River Basin

Spring Name	County	Mean Flow (cfs)
Elk Lick Spring	Pettis	0.05
Chouteau Spring (East)	Cooper	0.04
Chouteau Spring (Center)	Cooper	0.04
Chouteau Spring (West)	Cooper	0.04

The Lamine basin is almost unique in Missouri for its combination of prairie and Ozarkian streams. Streams such as Richland Creek, Gabriel Creek, Haw Creek, and Flat Creek generally support an assemblage of aquatic life that is more characteristic of the Ozarks than that in Muddy Creek or Heaths Creek.

Water Quality Concerns

Acceptable water quality is defined by Missouri's Water Quality Standards [<http://www.sos.state.mo.us/adrules/csr/current/10csr/10c20-7a.pdf>]. Streams or lakes that do not meet these standards are considered "impaired". They may not be fit for certain uses, such as swimming, drinking water supply, or protection of fish and other aquatic life. Waters are considered to be "affected" rather than "impaired" if water quality changes are less serious and state standards are not exceeded. These standards also list over 3600 classified streams and over 400 classified lakes in the state. A classified stream is one that is either a permanently flowing stream or one that may stop flowing in dry weather but still maintains large pools of water that support aquatic life. Unclassified streams are the small tributaries to classified streams that do not typically maintain pools capable of supporting aquatic life for the entire year.

Water Quality in Prairie Streams

<http://www.dnr.mo.gov/wpscd/wpcp/watersheds/info/wq-prairie-str.pdf>

Point Source Pollution

Point source pollution is a discharge of wastewater from a single location such as a wastewater treatment plant. Wastewater treatment plants can serve industries, small businesses, subdivisions, mobile home parks, apartment complexes, or entire cities. Wastewater from residential sources such as subdivisions, apartments and mobile home parks is often referred to as “domestic wastewater”. It contains primarily treated human wastes, food wastes and detergents. The primary pollutants of concern in domestic wastewater are the amount of organic matter, which is commonly reported as biological oxygen demand (BOD), suspended solids, and ammonia. Industrial and commercial wastewater can be more complex and may contain, in addition to domestic wastes, heavy metals or man-made organic chemicals that can be potentially toxic. Discharges from most municipal wastewater treatment plants are usually a mixture of domestic and industrial/commercial wastewater. Most wastewater plant discharges are also typically high in nitrogen and phosphorus. These two elements act as fertilizers and can cause excessive algae growth in waters receiving these discharges.

There are 47 permitted domestic, industrial, or commercial point sources discharging a combined 11.2 million gallons per day (mgd) into the waters of the Lamine River Basin. By far the largest single point source is the Tyson Foods processing plant northwest of Sedalia. It discharges 6.44 mgd (million gallons per day) into a stream in the Little Muddy Creek watershed. The City of Sedalia’s three wastewater treatment plants are the only other very sizable point sources in the basin, discharging 1.0 to 1.4 mgd each. The lengths of stream over 0.5 mile impaired or affected by these and other point sources in the basin are shown in Table 3.

Table 3. Point Sources Impairing or Affecting 0.5 or More Miles of Stream in the Lamine River Basin.

Facility	Stream	Miles Impaired	Miles Affected
Tyson Foods	Tributary to Little Muddy Creek, Little Muddy Creek, Muddy Creek	3.0	8.0
Sedalia North WWTP	Sewer Branch	0.1	2.5
Stover Southwest and Northwest WWTPs	Gabriel Creek	1.1	1.0
Sedalia Southeast WWTP	Breakfast Branch	0	1.0
Pilot Grove WWTP	Tributary to Chouteau Creek	0.2	0.7
South Walnut Hills Subdivision	Tributary to Coon Creek	0.5	0.1
La Monte Southeast WWTP	Tributary to Muddy Creek	0	0.5

The impact of the Tyson processing plant is different than that of domestic wastewater treatment plants. In addition to elevating nutrient levels, it has also consistently raised the temperature of the receiving stream, and imparted a reddish-brown tint to the otherwise

clear stream that is not typical of local streams. The substance causing the discoloration has not been identified at present. A settlement was recently negotiated between Tyson and the DNR which should lead to Tyson improving its treatment process so that the temperature of the receiving stream is not raised more than is allowed by water quality standards.

A combined sewer overflow, or CSO, can occur when runoff from rainfall uses the same sewer system as domestic sewage. Runoff from very large storms can overload the sewer system, causing it to overflow at certain points, carrying raw sewage into streams. CSOs into Sewer Branch near the Sedalia North WWTP have been a problem at times. Plans are currently pending for a CSO treatment facility near Hubbard Park, which should help manage the problem.

Wastewater Treatment

<http://www.dnr.mo.gov/wpscd/wpcp/watersheds/info/wastewater-treatment.pdf>

Nonpoint Source Pollution

Nonpoint source pollution occurs when pollutants enter bodies of water at many locations over a wide area rather than at specific, well-defined points. Examples include the erosion of sediments or the entrance of polluted surface runoff or groundwater into lakes and streams. Locations of nonpoint source pollution are often widely dispersed and are difficult to identify or control.

Habitat impairment is a serious concern in this basin. Of the 489.6 miles of classified stream in the basin, 417.6 miles, or 85 percent, are considered to be impaired habitat for aquatic life. The lack of infiltration of rainfall, when combined with local soil tillage and other land uses, leads to a large amount of surface runoff during wet weather. This contributes to soil erosion and high levels of sediment deposition in streams. The quality of aquatic habitat is further impaired by removal of wooded riparian vegetation, and by the channelization, or straightening, of streams. Channelization, however, is generally performed on prairie streams rather than on streams characteristic of the Ozarks, and is therefore not a major concern in the Lamine River basin.

Atrazine is an agricultural herbicide used on corn and grain sorghum that is commonly found in stormwater. Missouri's water quality standards allow no more than 3.0 µg/l Atrazine in drinking water reservoirs as a long-term average. The only reservoir used as a public drinking water source in the Lamine River basin is Spring Fork Lake. The long-term average level of Atrazine there is 1.4 µg/l. Levels of Atrazine in finished drinking water supplies may be significantly lower than the amounts found in the reservoirs if the drinking water plants take measures to reduce Atrazine during the water treatment process. Drinking water reservoirs throughout northern and western Missouri are also monitored for several other common agricultural herbicides. Results of this monitoring over many years indicates that the only other herbicide that may be a human health concern in drinking water reservoirs is Cyanazine. None of the drinking water reservoirs

in this basin exceed health advisory levels for Cyanazine. Federal regulations require the end of all Cyanazine use in 2002.

Groundwater can also be affected by nonpoint source pollution. In northern and western Missouri, some public water supplies and many private water supplies come from groundwater. While public groundwater supplies are routinely tested and protected, many private wells are not. Studies of water quality of private wells in northern and western Missouri show that about one third of wells exceed the drinking water standard for nitrate. About two percent exceed drinking water standards for pesticides. This contamination is often caused by local land use practices or surface contamination of the wellhead and does not represent widespread contamination of the underground aquifer. Deeper aquifers are protected from surface contamination by impermeable strata.

During warm weather when stream flows are low, livestock tend to gather in and around streams. The wastes they leave in the water contribute to nuisance algae growths, low levels of dissolved oxygen and elevated levels of ammonia and bacteria.

Water Quality Management

The department achieves water quality management of point source pollutants through the issuance and enforcement of wastewater discharge permits. These permits limit the amount of pollutants that can be discharged. All point source wastewater dischargers must obtain a permit and adhere to its discharge limitations. All permits require a level of treatment at least equal to national wastewater treatment standards. In situations where these national treatment standards are not adequate to protect the streams or lakes receiving wastewater discharges, stricter permit limits that do protect these waters are required. The department requires dischargers to conduct regular monitoring of discharge quality and report their results. The department also conducts regular inspections of wastewater treatment facilities and receiving waters.

Nonpoint source pollution is addressed through the state's nonpoint source management plan. This plan is a cooperative project between the Missouri Department of Natural Resources and many other federal, state, and local government agencies, organizations, local landowners, and other interested citizens. The plan emphasizes addressing problems at the watershed level through the use of management practices that control nonpoint source pollution. Some of the most commonly supported practices are those that control soil erosion on tilled land and improve quality and quantity of forage on grazing lands. Others protect riparian zones or control runoff of animal manures, fertilizers, and pesticides. The state nonpoint source management plan is a voluntary program that provides funds, in the form of grants, to help defray the cost of adopting improved management practices. The nonpoint source watershed management project that has taken place in this basin is described in Table 4.

Table 4. Nonpoint Source Watershed Projects in the Lamine River Basin

Watershed Name	County	Project Date	Pollutants	Watershed Size (Acres)	Acres Needing Treatment	Acres Treated	Percent of Watershed Treated
Shaver Creek	Pettis	1994-9	sed., nut., pest.	19,524	9,081	7,104	36%

The Total Maximum Daily Load (TMDL) is a calculation of how much of a pollutant may enter a waterbody without violating water quality standards, and of limits for the discharge of that pollutant from specific sources. TMDLs have already been written for temperature in Little Muddy Creek and its tributary from the Tyson plant, and for ammonia, BOD, and suspended solids in Brushy Creek and Muddy Creek. TMDLs are tentatively scheduled to be written for algae in Spring Fork Lake in 2004, and for BOD in Gabriel Creek in 2005.

The Missouri Department of Natural Resources monitors water chemistry and aquatic invertebrate communities at many locations in Missouri. The department also tracks the quality of domestic, industrial and storm water discharges. These monitoring activities provide information on water quality problems, such as their specific location, pollutants, sources and possible solutions. This information guides the management activities the department takes to protect water quality in Missouri.

For more information you can visit the following web sites:

TMDL Fact Sheet

<http://www.dnr.state.mo.us/oac/pub2090.pdf>

<http://www.dnr.state.mo.us/wpscd/wpcp/tmdl/wpc-tmdl-EPA-Appr-date.htm>

United States Geological Survey, Water Resources of Missouri

<http://mo.water.usgs.gov/>

United States Environmental Protection Agency Region 7

<http://www.epa.gov/region7/water/index.htm>

Missouri Department of Conservation

<http://www.mdc.state.mo.us/fish/watershed/lamine/contents/180cotxt.htm>

United States Army Corps of Engineers, Kansas City District

<http://www.nwk.usace.army.mil/>